sion so that maximum bandwidth is unaffected by it. Inversion manifolds such as shown in Fig. 5 have been computed for other modes and particularly for the case $\epsilon_2 < \epsilon_1$ which leads to backward waves [9].

It appears that the two sequences TE_{11}–TM_{01}–TE_{21}–TE_{01} and TE_{11}–TE_{21}–TM_{01}–TE_{01} are the only modal sequences possible for the case $\epsilon_2 > \epsilon_1$, at least for values of this ratio up to 200.

Conclusions

The foregoing treatment demonstrates that by proper dielectric loading of circular waveguides the bandwidth advantage of homogeneously loaded square waveguides versus circular may be reduced to within 2.5 percent of center frequency (~31.8 percent for circular versus ~34.3 percent for square). This effect is important in the design of wide-band phased-array radiators. Bandwidth increases above these limits may be possible for a circular waveguide loaded with three different dielectrics instead of two. However, this case appears to be too impractical for implementation. Interestingly, the full bandwidth advantage of the square waveguide cannot be restored by lining it with dielectric. In sharp contrast to the circular waveguide, the bandwidth of dielectric-lined square waveguides is always less than the fully filled guide value. A paper on this phenomenon will be published shortly.

In connection with the phased-array application it should be pointed out that the mutual coupling problem involving inhomogeneously loaded waveguides in infinite arrays has not yet been treated. In the absence of such a solution, a small array would probably have to be constructed and tested to ensure that the active element is well matched and without resonances (blind spots) within the design scan range and bandwidth.

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Letters

Comments on "Accurate Determination of Varactor Resistance at UHF and its Relation to Parametric Amplifier Noise Temperature"

A. UHLIR, JR.

In the above paper,[1] a letter[2] written by me is cited as erroneously suggesting that the series resistance of varactor diodes varies inversely as the square of the frequency. Anyone who refers to my letter will see that the opposite is the case. I showed that such a result could be explained as a measurement artifact, the frequency-dependent transformation of losses in a distributed circuit.

My letter was written in support of an earlier hypothesis that the series resistance would not be very frequency dependent. The measurements[1] confirm that hypothesis.

Manuscript received June 6, 1973.
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